1967

An Einstellung test correlation with Milgram's word meaning test

Dennis E. Lager
University of the Pacific

AN EINSTELLUNG TEST CORRELATION WITH MILGRAM'S WORD MEANING TEST

A Thesis

Presented to

The Faculty of the Psychology Department

University of the Pacific

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

---

by

Dennis E. Lager

November 1967

This thesis, written and submitted by

Dennis Eugene Lager,

is approved for recommendation to the Graduate Council, University of the Pacific.

Department Chairman or Dean:

W. Edgar Gregory, Chairman

Thesis Committee:

W. Edgar Gregory, Chairman

William O. Binkley

Wilfred M. Mitchell

Dated April 23, 1968

TABLE OF CONTENTS

CHAPTER PAGE

CHAPTER I

The Problem and Definitions of Terms Used

The Problem

The Statement of the Problem

A most important consideration in the area of Psychometrics is the concept of "validity". The question raised by the concept is: "What does this test measure?" To answer the question, we may either correlate the test being examined with some objective criteria or with another test. As we attempt to validate tests our knowledge of what the basic mental and personality traits are and how they relate to one another continues to grow and change.

The test instruments in this study are thought to measure rigidity in personality and concreteness in cognition. Therefore, a specific population considered high in these human factors is chosen for this study. Although some would say that such a population would tend to bias this present study by producing a high correlation, the fact is that such a high correlation would tend to support the idea that these tests do measure what they purport to measure. If an average normal population produced no correlation at all, it would tell us nothing of the tests.

The purpose of this study is to determine whether Luchins' Water Jar Problems, an Einstellung test supported by a great deal of validation data, and Milgram's Word Meaning test, a relatively new test with almost no validation data, are positively or negatively related, and whether or not the relationship is statistically significant. If a significant relationship is found, it will give some validity to Milgram's Word Meaning test.

The Hypothesis

It was hypothesized that there would be a positive and statistically significant correlation between the Einstellung test and Milgram's Word Meaning test, giving some validity to Milgram's test supporting the idea that some relationship exists between the personality traits thought to be measured by these two tests.

Definitions of Terms Used

Einstellung

The Einstellung-Effect is "an objective set, one developed by the sequence of events in the actual experimental situation as distinguished from a set of attitudes which is more 'subjective' in nature, say, one which the subject brings to the experimental

session (Luchins, 1959, p. 111)." The "objective set" is an attempted manipulation of behavior in an experimental situation; if the behavior is not manipulated, it is considered rigid. In the Water Jar Problems test the subject is taught two methods of solving problems, then he is given a series of problems using just one method, then a problem which demands the other method not yet used, be used. But if because of earlier success the subject does not change the method of problem solving, the Einstellung-Effect is considered to have occurred.

Rigidity

Rigidity refers to a slowness or sluggishness, or even fixation, when variation of response to stimulus is necessary. It is relative inability to change one's behavior or attitude when the objective conditions demand change. Rigidity is resistance to undertaking a new kind of response in either an experimental or life situation.

The Criteria of Abstract and Concrete Thinking

Scored for Abstract thinking, the Milgram test measures the continuum of Abstract and Concrete thought. As defined by Milgram

high scores are indicative of "abstract" thinking; low scores are indicative of "concrete" thinking.

CHAPTER II

A Review of the Literature

Since this thesis is concerned with a correlation between two tests, and the validation of one against the other, this chapter is a review of the literature relevant to each instrument. The literature on Luchins' Water Jar Problems test is presented first, followed by the literature on Milgram's Word Meaning test.

Literature Relevant to Luchins' Einstellung Test

The Water Jar Problems test was developed by A. Luchins (1942) to measure the Einstellung or E-Effect. A detailed description of this test may be found in Chapter III under the Side Heading: The Water Jar Problems test.

Luchins (1942) presented five preliminary hypotheses for an understanding of the E-Effect. First, if a response is made in several similar successive situations, there is a tendency to repeat the response in following similar situations. Second, blindly repeating a response is not generally characteristic of human behavior; thus the general tendency is created by special factors in the situation. Third, the E-Effect is not a mechanical response but

a result of intelligent assumptions. A subject may think one of the following assumptions: 1) "The E-method worked in the past; it ought to fit the following." 2) "It is improbable that these problems have different solutions; thus this must not be a chance distribution but problems all of one type." 3) "I will not seek each problem's appropriate solution, but for expediency's sake I will just use what has worked in the past." Fourth, the Einstellung-Effect may occur only if the problems are in a unitary group, similar to the Gestalt effect. And fifth, if we are to comprehend characteristics of a whole situation, narrow mindedness will not help comprehension.

Luchins' initial population for test development included grade school, college, and graduate students and several professors, some with Ph. D. degrees. Luchins had 29 groups for a total population of 1,093 in his original validation study.

All 29 groups displayed a large E-Effect regardless of age, level of education or I. Q. The percentages of E-Effect ranged from 27% to 87%, only two percentages falling below 50 percent. The mean was 64 percent.

In varying the number of E problems, he found that increasing them only increased the E-Effect. In other words, the more success an individual has with a particular method the more difficult it is for him to change.

After reviewing the usages of the E-Effect in 1951, Luchins concluded that the Einstellung-Effect was due to lack of variability, lack of frustration tolerance, lack of tolerance of ambiguity, and due to concrete-mindedness.

In a study in which Rokeach (1948) correlated the California Ethnocentrism Scale with the Water Jar Problems test, he hypothesized that the rigidity inherent in the ethnocentric person's solution of social problems was not an isolated phenomenon within the personality but rather an aspect of a general rigidity factor which manifests itself in the solution of any problem, be it social or non-social. He also hypothesized that the mode of thought of the ethnocentric person in problem solving is more concrete in nature, whereas the mode of thought of the non-ethnocentric person in problem solving is more abstract in nature. The subjects were University of California Sophomores in Elementary Psychology. They were tested in groups of 35 to 48 at a time for a total population of 92. The Luchins' Water Jar Problems test was modified by eliminating the extinction problem, problem nine. Concreteness was measured by the subject's use of scratch paper and the writing out of problem solutions.

The results supported the hypotheses that rigidity is a general personality factor manifesting itself in solving social or

non-social problems, and that the ethnocentric person is more concrete in his nature of problem solving than the non-ethnocentric person. Due to the great similarity in data, the results were not reported according to sex.

The above study led to a conflict in the use of Luchins' Water Jar Problems test due to the omission of the extinction problem. In a survey, McNemar and Taylor (1955) found that the actual number of Einstellung critical and extinction problems used varied from study to study. The most common variation was to omit the extinction problem and to use only the critical problems, numbers 7, 8, 10, and 11, as a measure of rigidity or inflexibility. It was this variation to which Luchins (1951) objected. Luchins argued that an E-method or set solution was not incorrect or necessarily less efficient; therefore just the use of the E-method or set solution was not necessarily evidence of rigidity or inflexibility, because the extinction problem was the only problem which demanded a change in method or flexibility in solving the problems. Luchins advocated that "Einstellung refers to the 'set' and not to the ability to change one's 'set' or (voluntarily) 'recover' from a set (Luchins, 1949, p. 456)."

Werner (1946) discussed the ambiguity of the term "rigidity". According to him ambiguity is caused by differing definitions, some

functional and some structural. Added to this is confusion between rigidity and stability.

In Luchins' functional definition "rigidity" refers to the occurrence of the Einstellung-Effect defined in Chapter I. In Werner's functional definition "rigidity" refers to sluggishness in the variation of response. This is a characteristic observed in brain damaged and in organically unimpaired frustrated individuals.

In the structural definition "rigidity" refers to the degree of segregation, the relative independence of regions or areas of behavior such as social behavior, academic behavior or religious behavior. The greater the independence the areas have, the greater the "rigidity".

In "rigidity" versus "stability", "stability" of behavior requires an adaptability of response in order to preserve the functional equilibrium of the organism in the face of changing situations. Here "rigidity" is the opposite of "stability".

Literature Relevant to Milgram's Word Meaning Test

In 1956 J. Flavell experimentally investigated the schizophrenic's difficulty in dealing with word meanings in an attempt

to find out if a relationship between that impairment and the schizophrenic's impairment in social relationships was demonstrable.

Flavell hypothesized: First, that normal subjects more so than schizophrenic subjects would select an abstract choice word over a concrete choice word in response to a stimulus word. Second, that within the schizophrenic group the tendency to select abstract choice words over concrete choice words would be positively correlated with adequacy in everyday social interaction as rated by judges.

The subjects for Flavell's study were 20 normal hospital aides who responded to a hospital-wide call for volunteers, and 24 chronic schizophrenics hospitalized one to twelve years. The normal and schizophrenic subjects were matched for years of formal education and for verbal I. Q. The verbal I. Q. was measured by the Wechsler-Bellevue Vocabulary subtest. The mean age for normals was 29. 2 years and for schizophrenics, 35. 2.

Flavell designed his own test for this study. It consisted of 72 cards: 56 test cards and 16 control cards. Each card had a single stimulus word printed in capital letters at the top and two choice words, side by side at the bottom. All the stimulus words were nouns; the choice words were verbs, nouns, and adjectives.

There were eight different types of relationships between stimulus and response words; seven may be found in Milgram's version of the test given in Chapter III. The eighth relationship which Milgram omitted was: Homonym e. g. "boy"-"buoy"; it was considered a concrete or non-essential meaning relationship.

Flavell administered the test individually. Each subject was asked to look at the stimulus word on each card and then choose the choice word which he thought was the "closest in meaning" to the stimulus word. Adequacy in social interaction was rated by ward nurses on a four point scale. One point meant complete absence of social interaction and four points meant normal social interaction. Four variables were observed:

> Sociability - the extent to which the subject spontaneously tried to interact with those about him, regardless of the success of his efforts.
> Emotionality - the extent to which the subject responded with appropriate emotionality to people and events about him.
> Coherence - the extent to which the subject's communications were coherent or understandable to those for whom they were intended, the fact that what was communicable might be delusional in content was irrelevant as far as scoring this variable was concerned.
> Awareness - the extent to which the subject gave evidence that he paid attention to or seemed aware of the happenings going on about him (Flavell, 1956, p. 209).

Flavell's results confirmed both hypotheses at the .01 level of confidence. Flavell developed an instrument that differentiated

between schizophrenics and normals, perhaps not adequate for clinical purposes but apparently adequate for experimental purposes.

Milgram (1959) enlarged upon the earlier investigation of Flavell (1956). Some modification in procedure, in adding new word items, and deleting others resulted in a 48 item test. Like Flavell's, Milgram's version had each item contain a stimulus word and two choice words. As a result of Milgram's work, Flavell's instrument came to be known as Milgram's Word Meaning test. For further information about this instrument see Chapter III under the Side Heading: The Word Meaning Test.

Milgram's study compared the preferences of normal, schizophrenic, and brain-damaged subjects for abstract or essential versus concrete or non-essential word meaning relationships.

All subjects were male. Normal subjects were drawn from medical wards of a Veteran's Administration hospital and from the general population outside the hospital. They totaled 20 in number. The schizophrenics had had no somatic therapy within the past six months and were 32 in number. There were 30 brain-damaged subjects with a neurological diagnosis of damage to the cerebral cortex and no evidence of psychosis at the time of testing. The clinical groups also came from Veteran's Administration hospitals.

Statistics on the normal group were as follows: The age Mean was 44.6 with a SD of 15.2. The Mean for the years of formal education was 12.0 with a SD of 2.7.

Milgram's results were as follows:

		Normals	Schiz.	Brain-Dam.
Total Abstract Score	M	42.60	38.38	31.84
	SD	3.21	7.56	7.07

(Milgram, 1959, p. 210).

The normals chose abstract words significantly more than did the schizophrenics, at the .01 level of confidence. The schizophrenics chose abstract words significantly more than did the brain-damaged, at the .001 level of confidence.

Milgram concluded that a person may retain the ability to produce creditable definitions to words without retaining the ability to discriminate the abstract-concrete continuum of word meaning. This conclusion applied to both the schizophrenics and the brain-damaged, but more specifically to the brain-damaged.

Schwartz (1967) hypothesized that, on a battery of cognitive tasks, grade school educated schizophrenics would have a significantly greater difference from their comparably educated controls than the college educated schizophrenics would have from their comparably educated controls.

All subjects were hospitalized patients between the ages of 20 and 50 years. There were 40 remitted schizophrenics, all hospitalized at least one year. The normal subjects were patients on medical and surgical wards with no history of emotional disturbance. All subjects were told the general nature of the tests, and only those who willingly cooperated were used.

In test selection an attempt was made to include instruments representative of abilities tested in previous research. The tests involved reasoning, abstraction, and timed perceptual tests. The test battery contained four instruments; the most relevant was Milgram's Word Meaning test. However, where Milgram used a separate card for each stimulus word, Schwartz consolidated the 48 items on a single sheet to facilitate testing; this technique adapts very well to group administration and was used in the present study.

The results supported the hypothesis that college educated schizophrenics would be closer to their college educated controls than the grade school educated schizophrenics would be to theirs. The results were just short of the .05 level of statistical significance. Schwartz suggested that although cognitive functioning is only one aspect of general social adequacy, the college schizophrenics had more at stake than the grade school educated

schizophrenics because of more formal education. Therefore, they would try harder to show cognitive adequacy.

CHAPTER III

The Instruments and Procedure

The Instruments

Two instruments were used in this study: Milgram's Word Meaning test, an instrument involving verbal ability, and Luchins' Water Jar Problems test, an instrument involving quantitative ability.

The Water Jar Problems Test

This test was developed by Abraham Luchins (1942) and was designed specifically for the study of the Einstellung-Effect.

The test consists of 11 problems. In the present study, one verbal problem was added at the end to simplify the statistics.

The test is arranged in sections according to the purpose of the problems; the sections were indistinguishable from each other except for problems one and two. The first two problems are example problems to teach the subjects the "direct-method" and the "Einstellung" or "E-method" of solution.

The test consists of four columns of numbers: A, B, C, and the column of numbers, (#), to be obtained. The "direct-method" is simply subtracting one number or adding one number to another

number: e.g. (B-A=#) or (A+C= #). The "E-method" is more involved. But, it can be expressed in a relatively simple equation: B-A-2C=#. To make the necessary operations as simple as possible, no single number in the whole test format is larger than three digits.

The next four problems, problems three through six, are called "set inducing" problems. These are solvable only by the E-method, except problem five which could be solved by A+2C and problem six which could be solved by B-7C.

Problems 7, 8, 10, and 11 are called the "test" or "critical problems". These problems can be solved by either the "direct-method" or the "E-method".

Problem nine is called the "extinction problem" and is not solvable by the "E-method". The "direct-method" must be used.

Problem 12 is a verbal problem which was included to give an even number of problems and also to indicate possible "recovery" from the Einstellung-Effect. It has two solutions: First, the subject could just fill one jar and have the correct number. Second, the subject could perform the following equation: B - 3A - 3C = A or #.

The subjects of the present study were asked to solve each of the 12 problems after they were shown both methods of solution in

example problems one and two. Luchins' standard instructions were used.

In scoring the test, failure to solve problem nine, plus the use of the "E-method" in problems 7, 8, 10, and 11, was considered as possible evidence of the Einstellung-Effect. Solving problem nine was considered as possible evidence of independence of the subject from the Einstellung-Effect or possible evidence of his adaptability. The population on this basis was divided into "E" or "d" subjects, those who demonstrated the Einstellung-Effect and those who did not, respectively.

The highest possible correct score on this test was 12. The lowest possible correct was two because the subjects had to demonstrate their ability to solve the example problems to remain a part of the population. This requirement insured that all subjects knew both the direct and E-method of solution.

The Word Meaning Test

The Milgram (1959) modification of Flavell's (1956) test resulted in a 48 item test. A copy of this test appears in Appendix A where the entire test battery is presented. Each item contains a stimulus word and two choice words. All stimulus words are nouns;

the choice words are adjectives, nouns or verbs. Each stimulus word is related to one of the choice words in one of three abstract ways and to the other choice word in one of four concrete ways:

1. Subordinate -- e.g. "car" - "Ford"
2. Supraordinate -- e.g. "car" - "vehicle"
3. Synonym -- e.g. "car" - "auto"
4. Adjective -- e.g. "car" - "flashy"
5. Concrete Context -- e.g. "car" - "garage"
6. Part Whole -- e.g. "car" - "fender"
7. Verb -- e.g. "car" - "drive"

Numbers one through three are abstract relationships; four through seven are concrete (Milgram, 1959, p. 209). An example from Milgram's test is item 13. SICKNESS: "hospital" - "illness"; "hospital" has a concrete context relationship to "sickness" and "illness" has an abstract synonym relationship.

Subjects were asked to look at the stimulus word in each item and choose the choice word which they thought meant most nearly the same as the stimulus word.

The test was scored for the choice of abstract words over concrete words. The total possible correct or possible abstract choices was 48.

Procedure

Test Administration

Since the subjects of the present study were chosen from the Assemblies of God denomination, this population, discussed in Chapter IV, was tested on a Tuesday, Thursday, or Friday evening depending on the congregation's midweek prayer service.

A test battery, five pages in length, was given to each subject and administered in a group setting. The first page was a general information questionnaire requesting age, sex, years of formal education, city, state, and state of birth. The second page contained the example problems for the Water Jar Problems test. One page contained the Water Jar Problems test, followed by one page of scratch paper. And one page contained Milgram's Word Meaning test. The Word Meaning test page and the Water Jar Problems test pages were alternated to cancel the effect of attitudinal changes which may have occurred during testing. Each test page contained a short paragraph of instructions.

All instructions were read aloud to the groups before the testing period began. This time of introduction was also used to explain the importance of their participation and to answer possible questions.

Statistical Procedure

Most of the statistics were done on an IBM 1620 Computer at Seattle University. Three computer cards were made for each subject. Each card contained the subject's identity number and two scores. Three two-variable correlations were then run off on the computer. The Word Meaning test was correlated with the Water Jar Problems test, with the number of Years of Formal Education, and with Age.

The correlations Rs were then checked against Table 25 in Garrett (1964, p. 201). This table presented correlation coefficients at the .05 and .01 levels of statistical significance. The table was built on a two-tail test of significance with 1000 degrees of freedom. This study had 76 degrees of freedom, N-2, and interpolation was necessary between 70 and 80 degrees of freedom.

The Mean of the Word Meaning test in this study was checked for significant difference against the Mean for normals and the Mean for schizophrenics in Milgram's (1959) study. This was done with the following equations:

$$\sigma_D = \sqrt{\frac{\sigma_1^2}{N_1} + \frac{\sigma_2^2}{N_2}} \qquad \text{and} \qquad CR = \frac{D}{\sigma_D}$$

Following Garrett, if CR, the critical ratio, was less than 1.96, the two means were considered in the same distribution and their difference occurred only by chance. If the CR was 1.96 or more, the difference between the means was significant at the .05 level. If the CR was 2.58 or above, the difference between the means was significant at the .01 level.

CHAPTER IV

The Population

The population for this study came from three church congregations, two from the Assemblies of God denomination in the United States. The third congregation came from the Pentecostal Assemblies of Canada, which is the Canadian equivalent to the Assemblies of God denomination in the United States. The congregations were all located on the West Coast of the North American Continent--one in Stockton, California, U. S. A., one in Bellevue, Washington, U. S. A., and one in Chilliwack, British Columbia, Canada.

The midweek prayer attendance was chosen as the specific population for three reasons: 1) It was the most informal of any service during the week. 2) It would yield the most homogeneous population. 3) And it would have the personalities most typical of the membership of the chosen denomination.

The population was made up of members of the congregations who volunteered their cooperation for this study. The sizes of the groups tested were 28, 22, and 28 in number, for an average of 26 and 2/3 persons per congregation. Another factor which determined the size of the population was the exclusion of those

subjects who could not do the example problems on the Water Jar Problems test. The final population totaled 78 in number, 48 women and 30 men.

Age in the population ranged from 10 to 76 years. The Mean for age was 33.60 years. The Standard Deviation for age was 19.23 years.

In the population the Years of Formal Education ranged from 5 to 16 school years. The Mean for education was 10.90 years. The Standard Deviation was 2.69 years.

The examiner was a member of the Assemblies of God denomination. He had on past occasions spoken to the selected congregations along theological lines. Pastors of the selected churches had known the examiner for periods ranging from nine months to six years. This familiarization aided in gaining the cooperation of the population and in the development of trust between the population and the examiner.

Fundamental orthodox religious groups may be attractive to persons of rigid personality and research data has been difficult to gather from such groups as suggested by various studies previously done in the area of rigidity. And since the author had access to cooperative members of the Assemblies of God denomination, it was thought appropriate to use this population.

CHAPTER V

Results

The Water Jar Problems test scores had a mean of 9.14 and a Standard Deviation of 2.62. The population showed a 53 percent Einstellung-Effect. This was somewhat below the 64 percent average which Luchins (1942) found on his initial study. Thus, if the E-Effect was used as an indication of rigidity, this population tested less rigid than the norm found by Luchins.

Luchins felt that reliance on scratch work could be considered as possible evidence of concreteness, although he gave no statistical data to support this. Such reliance was indicated by 74 percent of the population, showing a larger percentage of concreteness in the population than was demonstrated by the E-Effect, hinting at the possibility of various degrees of concreteness.

The Word Meaning test scores, in this study, had a Mean of 39.26 and a Standard Deviation of 7.67. This Mean fell between the Mean for normals and the Mean for schizophrenics obtained by Milgram (1959). It did not differ significantly from either.

The correlations were as follows: The Word Meaning test and the Water Jar Problems test had a correlation r between each other of .35. With 76 degrees of freedom the hypothesis was

confirmed beyond the .01 level of statistical confidence. The tests were positively and significantly related.

With a correlation r of -.07, between the Word Meaning test and Age, there was no significant relationship.

The Word Meaning test and the Years of Formal Education had a correlation r of .10, which also is not a significant relationship.

The last two correlations showed that the Word Meaning test, a measure of the abstract-concrete continuum, was not related to Education or Age.

Thus, the hypothesis that the Einstellung test and Milgram's Word Meaning test would be positively and significantly related is supported by the present study. It must of course be kept in mind that this study had a selected population, not typical of the general population and limited in number. Any generalizations made about other groups from the results of this study should be made with caution.

CHAPTER VI

Summary

This study was concerned with two test instruments and their correlation. One instrument was Luchins' Water Jar Problems test, an Einstellung test considered a measure of rigidity in human personality. The second instrument was Milgram's Word Meaning test, considered a measure of the abstract-concrete continuum of human cognition.

A review of the literature indicated a possible relationship between rigidity in personality and concreteness in cognition. It was therefore hypothesized that there would be a positive and statistically significant relationship between these two instruments because they were purported to measure rigidity and concreteness of thought.

A sample population, 78 in number, was chosen from a denomination of Christian Fundamentalists because it was assumed to represent both rigidity of personality and concreteness of thought.

The instruments were administered in a group setting after a mid-week prayer service.

The tests were then correlated on an IBM 1620 Computer. The correlation r between the two instruments was .35; with 76 degrees of freedom, the results confirmed the hypothesis. The

Water Jar Problems test and the Word Meaning test were positively and significantly related beyond the .01 level of statistical confidence. This correlation gives some validation to the Milgram test, meaning that persons who demonstrated rigidity of personality also demonstrated concreteness in thinking.

References

Flavell, J. Abstract thinking and social behavior in schizophrenia. Journal of Abnormal and Social Psychology, 1956, 52, 208-211.

Garrett, H. Statistics in psychology and education. New York: David McKay Company, Inc., 1964.

Luchins, A. Mechanization in problem solving: The effect of Einstellung. Psychological Monographs, 1942, 54, No. 6.

Luchins, A. On recent usage of the Einstellung-Effect as a test of rigidity. Journal of Consulting Psychology, 1951, 15, 89-94.

Luchins, A. Rigidity of behavior. Eugene: University of Oregon Books, 1959.

McNemar and Taylor. Problem solving and thinking. Annual Review of Psychology, 1955, 6, 455-477.

Milgram, N. Preference for abstract versus concrete word meaning in schizophrenic and brain damaged patients. Journal of Clinical Psychology, 1959, 15, 202-212.

Rokeach, M. Generalized mental rigidity as a factor in ethnocentrism. Journal of Abnormal and Social Psychology, 1948, 43, 259-278.

Schwartz, S. Cognitive deficit among remitted schizophrenics: The role of a life-history variable. Journal of Abnormal Psychology, 1967, 72, 54-58.

Werner, H. The concept of rigidity: A critical evaluation. Psychological Monographs, 1942, 54, No. 6.

Appendix A

Test Battery

AN EINSTELLUNG TEST

CORRELATION WITH MILGRAM'S

WORD MEANING TEST

Years of Formal Education: _____

Age: _____ Sex: _____

City: _____ State: _____

State of Birth: _____

We ask you to participate in an experiment for the University of the Pacific in Stockton, California. No private information is asked of you and all results will be kept confidential. Your cooperation is greatly appreciated. Thank you.

Dennis E. Lager

Dennis E. Lager

WATER JAR PROBLEMS (WJP)

To help you learn what is expected of you, the following are two problems in the (WJP) test. These are examples. Imagine yourself near a source of water such as a kitchen sink or stream.

(1) You are given one empty jar which has a capacity of 29 quarts and another with a 3-quart capacity and you are requested to obtain 20 quarts of water. Bear in mind that there are no graduated markings on the containers. All you know about them is that when filled to the top one holds 29 quarts and the other 3 quarts of water. Start by filling the 29-quart jar; then use the empty 3-quart jar three times to remove the excess 9 quarts. Each time empty the contents of the smaller vessel into the sink or stream.

ARE THERE ANY QUESTIONS?

(2) Now try this problem: Given an empty jar with a capacity of 21 quarts, another with a capacity of 127 quarts, and a third with a capacity of 3 quarts, you are requested to obtain 100 quarts of water. Allow yourself a maximum of two and one-half minutes to solve this problem.

PLEASE STOP UNTIL FURTHER INSTRUCTIONS!

WATER JAR PROBLEMS (WJP)

INSTRUCTION: To obtain the requested volume in each instance, use any or all of the jars mentioned in the problem. You will see that the first two problems are those which were just illustrated. If you cannot solve a problem within two and one-half minutes, go on to the next one. You may use scratch paper to work out your solutions. Please place your solution under its problem, either verbally or in mathematical symbols.

Problems:	Given Containers with These Capacities:			Obtain:
1. . .	--	29	3	20
2. . .	21	127	3	100
3. . .	14	163	25	99
4. . .	18	43	10	5
5. . .	9	42	6	21
6. . .	20	59	4	31
7. . .	23	49	3	20
8. . .	15	39	3	18
9. . .	28	76	3	25
10. . .	18	48	4	22
11. . .	14	36	8	6
12. . .	Given a 4-quart jar, a 67-quart jar and a 17-quart jar, get 4 quarts of water.			

INSTRUCTIONS: Below you will find columns of STIMULUS words and columns of CHOICE words. The stimulus word is in the LARGE print and the choice words are in the small print. Select from the two choice words the "one that means most nearly the same" as the stimulus word. Choose only one choice word for each of the forty-eight stimulus words.

STIMULUS	Choice Words		STIMULUS	Choice Words	
1. TUNE:	// melody	// sing	25. BOAT:	// canoe	// row
2. ELECTRICITY:	// dynamo	// energy	26. VIOLIN:	// strings	// fiddle
3. PARCEL:	// package	// wrapper	27. FLOWER:	// garden	// rose
4. BOOK:	// page	// novel	28. WATER:	// liquid	// drink
5. SALT:	// spice	// sprinkle	29. EGGS:	// hen	// food
6. HOBBY:	// interesting	// stamps	30. KING:	// crown	// monarch
7. HARBOR:	// ships	// bay	31. TREE:	// Pine	// branch
8. HOUR:	// time	// minute	32. CAMERA:	// equipment	// lens
9. RABBIT:	// ears	// bunny	33. WEIGHT:	// heavy	// ton
10. KNIFE:	// dagger	// blade	34. WINTER:	// season	// cold
11. BLANKET:	// warm	// cover	35. WAGON:	// wheel	// cart
12. DOG:	// poodle	// bark	36. CANDY:	// gumdrop	// sweet
13. SICKNESS:	// hospital	// illness	37. STRING:	// tie	// twine
14. MOTHER:	// parent	// dear	38. BREAKFAST:	// morning	// meal
15. BIRD:	// nest	// robin	39. SALOON:	// tavern	// noisy
16. STAIRS:	// steps	// climb	40. RIVER:	// Mississippi	// flow
17. HAT:	// head	// clothing	41. WORLD:	// globe	// round
18. DREAM:	// nightmare	// sleep	42. BUREAU:	// drawer	// furniture
19. MOUNTAIN:	// high	// Rockies	43. LAKE:	// swim	// pond
20. SHIRT:	// garment	// sleeve	44. POCKETBOOK:	// purse	// money
21. SILK:	// smooth	// material	45. MOON:	// shine	// planet
22. BACON:	// meat	// fry	46. CONTAINER:	// box	// top
23. AUTO:	// drive	// Ford	47. GRANDMOTHER:	// old	// relative
24. STOVE:	// oven	// hot	48. DIRECTION:	// north	// compass

Appendix B

Raw Data

Code for Appendix B

O = no scratch work
S = scratch work

F = female
M = male

EA = eastern United States of America
SA = southern United States of America
WA = western United States of America
EC = eastern Canada
WC = western Canada
EU = Europe

C = Canada
W = Washington State, U. S. A.
L = California State, U. S. A.

Raw Data

Subjects' No.	(WM) Score	(WTP) Score	Educ.	Age	Scratch Work	Sex	Birth Place	Place Tested
01	47	09	08	47	S	M	WC	C
02	45	11	10	47	S	F	WC	C
03	48	12	12	22	S	F	WC	C
04	41	06	11	17	O	F	WC	C
05	45	10	13	19	S	M	WC	C
06	36	11	08	36	S	M	EC	C
07	42	08	15	69	S	M	EA	C
08	42	12	11	19	S	M	EC	C
09	42	12	10	16	S	F	WC	C
10	47	11	12	21	S	M	WC	C
11	42	10	12	43	S	M	EU	C
12	43	10	09	66	S	F	EC	C
13	47	10	06	51	S	M	EU	C
14	47	09	12	19	O	F	EC	C
15	42	09	12	59	O	F	WA	C
16	47	09	09	34	S	M	WC	C
17	40	11	06	61	O	M	EC	C
18	47	10	11	46	O	F	WC	C
19	43	12	08	14	S	F	WC	C
20	48	12	12	32	S	M	WC	C

Subjects' No.	(WMI) Score	(WJP) Score	Educ.	Age	Search Work	Sex	Birth Place	Place Tested
21	44	11	07	40	S	F	EU	C
22	43	13	11	20	S	F	WC	C
23	21	12	08	39	S	M	EU	C
24	36	09	09	20	S	F	WC	C
25	39	09	12	26	O	M	WC	C
26	32	11	12	18	S	F	EU	C
27	29	04	10	17	S	F	EC	C
28	37	03	11	18	S	F	EU	C
29	37	11	15	21	S	M	WA	W
30	47	11	14	52	S	F	WA	W
31	48	11	12	50	S	F	WA	W
32	46	12	16	51	S	M	WA	W
33	48	12	12	30	S	F	WA	W
34	34	11	12	36	S	M	WA	W
35	28	11	11	43	O	F	WC	W
36	37	11	14	50	S	M	WA	W
37	27	10	15	43	S	M	EU	W
38	25	07	10	50	O	F	EA	W
39	24	06	14	53	S	M	WA	W
40	48	12	14	20	O	F	WA	W

Subjects' No.	(WM) Score	(WTP) Score	Educ.	Age	Scratch Work	Sex	Birth Place	Place Tested
41	44	06	08	14	O	F	WA	W
42	36	05	05	12	S	F	WA	W
43	34	08	08	14	S	F	EA	W
44	43	09	06	12	O	M	WA	W
45	35	10	14	20	S	F	WA	W
46	48	12	16	22	S	F	WA	W
47	46	12	12	20	S	F	EA	W
48	45	10	16	21	S	M	WA	W
49	42	05	13	75	O	F	EU	W
50	35	10	13	76	S	F	EU	W
51	44	12	12	39	S	M	WA	L
52	47	08	13	21	S	M	WA	L
53	16	02	12	56	S	F	SA	L
54	40	04	13	67	O	M	WA	L
55	46	09	10	15	S	F	WA	L
56	45	06	07	12	S	F	WA	L
57	30	10	05	11	O	M	WA	L
58	39	11	11	35	S	M	WA	L
59	46	12	12	43	O	F	WA	L
60	31	08	07	13	S	M	WA	L

Subjects' No.	(WM) Score	(WJP) Score	Educ.	Age	Sexual Work	Sex	Birth Place	Place Tested
61	38	08	14	74	S	F	SA	L
62	41	04	09	15	S	F	WA	L
63	42	11	08	69	S	F	SA	L
64	19	08	12	43	S	M	WA	L
65	33	07	12	21	O	M	WA	L
66	34	08	05	10	O	F	WA	L
67	47	11	12	49	S	F	WA	L
68	26	08	10	29	S	F	WA	L
69	37	09	10	38	S	F	WA	L
70	41	12	09	15	S	F	WA	L
71	39	11	11	17	S	F	WA	L
72	40	11	13	74	O	F	SA	L
73	41	08	11	17	S	F	WA	L
74	36	04	08	67	S	F	EA	L
75	46	11	11	16	S	F	WA	L
76	24	08	11	17	S	M	WA	L
77	37	09	11	17	S	F	WA	L
78	41	07	14	47	S	F	WA	L